2006 *Spartina* Eradication Program
Water Quality Monitoring

January 22, 2007

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Introduction

Water quality monitoring was conducted in Willapa Bay, and Puget Sound, to detect the presence of glyphosate (Aquamaster™, Rodeo™, or Aquaneat™) and imazapyr (Habitat™) adjacent to locations where *Spartina* control activities were conducted. The monitoring activities, conducted by Washington State Department of Agriculture (WSDA), met the fourth year monitoring requirement of the Aquatic Noxious Weed Control National Pollution Discharge Elimination System Waste Discharge General Permit, WAG 993-000 (NPDES) *Spartina* section.

The purpose of monitoring was to record glyphosate and imazapyr concentrations in the effected water bodies subsequent to the treatments by different herbicide application modalities utilized for control of certain infestation types. The application/infestation matrices are shown in Table 1. Samples were collected to determine concentrations at the treatment site directly after applications, through time over several days after the applications and off-site directly after the application.

Table 1. Applications used for differing infestation types

Sample Location	Application Type	Herbicide	Infestation Type	Sample Type
South Nahcotta, Willapa Bay	Precision Broadcast	Glyphosate/ Imazapyr	Meadow	Concentration/ Concentration though time
Driftwood Shores, Island County	Precision Broadcast/ Hand Held	Glyphosate/ Imazapyr	Meadow	Off-site transport
Triangle Cove (west), Island County	Precision Broadcast/ Hand Held	Glyphosate/ Imazapyr	Meadow	Concentration
Triangle Cove (east), Island County	Precision Broadcast	Glyphosate/ Imazapyr	Meadow	Concentration through time

Pre-treatment samples were also collected at various sites in each water body at least 12 hours before any treatments were conducted to the sampled water body. Pre-treatment sampling was conducted to identify if any water bodies had pre-existing levels of glyphosate or imazapyr in the water column. All of these samples were returned negative for the presence of glyphosate and imazapyr.

Pre-treatment sampling was conducted at sites that were likely to be used as post treatment sampling sites or at nearby locations in each water body prior to any applications.

Treatments

Spartina treatments occurred between June 1 and October 30, 2006. All treatments were conducted by applicators licensed by WSDA using any of the application types listed in Table 1. Private landowners, United States Fish and Wildlife Service, WA State Department of Fish and Wildlife, WA Department of Natural Resources, WSDA, and county personnel, from Island, Skagit, and Snohomish Counties, conducted applications. All applications were made following the appropriate federal and state approved product labels.

A total of over 3,400 acres were treated with glyphosate and imazapyr employing an integrated approach during the entire 2006 treatment season. The entities conducting control made mixed use of integrated vegetation management (IVM) strategies; including chemical, mechanical, manual, and biological control approaches. All entities followed the guidelines identified in the Statewide *Spartina* IPM Plan.

Sites

In Willipa Bay concentration and concentration through time samples were collected at South Nahcotta on the Long Beach Peninsula. Three samples each were collected at this site in relation to a landowner who refused herbicide treatment on his property. A 100 foot buffer was measured between the southern edge of the treatment area and the northern edge of the property. Sample 1 was collected at the edge of the treatment area, sample 2 was collected in the center of the buffer, and sample 3 was collected on the property line.

In Puget Sound concentration samples were collected on the west side of Triangle Cove, Island County. Concentration through time samples were collected on the east side of Triangle Cove. Off site transport samples were collected at Driftwood Shores which is at the mouth of Triangle Cove. Page 9 shows the location of samples taken at Triangle Cove.

All concentration and concentration through time post treatment sampling sites were located at the shoreward edge of the treatment area, and samples were collected as the tide was flowing in over the treatment area. All off-site transport post treatment sampling sites were located at areas were the outgoing tide would move the material towards. Samples were taken during the first outgoing tide, after the treatment site had been inundated.

All concentration through time sampling was done between 24 and 48 hours after the final treatment to the site was completed.

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Sample Handling

All samples were collected no sooner than the subsequent high tide after the completion of treatment to the entire site. Water depth at sampling stations ranged from 6 inches to approximately 5 feet. Samples were sent to an accredited lab on ice, via overnight courier. The samples were occasionally stored overnight in a cooler inside a refrigerator before being shipped the next morning. This delay was incurred because the variable timing of sampling did not allow for immediate shipping. A Washington State Department of Ecology accredited laboratory using the method, EPA 547 for glyphosate analysis and an HPLC analysis method for imazapyr, analyzed all samples.

Efficacy

Some efficacy surveys were conducted during the treatment season. These mainly focused on the amount of "brown down" and new shoot development exhibited in the areas receiving trial treatments. The nature of the reaction of *Spartina* to glyphosate and imazapyr treatments makes complete, same-season surveys nearly futile. The plants turn brown to the ground, but the bulk of the roots may be unaffected. This sizeable amount of root mass beneath the surface may send up shoots the next growing season that were imperceptible the prior season.

Summary of Imazapyr Presence

Sampling for imazapyr was designe to detect the presence of the herbicide directly after application at the treatment site (concentration), directly after application away from the treatment site (off-site transport) and at the treatment site 24 to 48 hours after application (concentration through time). All the samples that were analyzed and found to have presence of herbicide were at acceptable levels.

Treatment Site: South Nahcotta (approximately 25 acres treated)

Sample 1 - concentration 0.224 ppm	**Sample 2 – concentration** 0.040 ppm
Sample 3 – concentration 0.002 ppm	

Treatment Site: South Nahcotta (approximately 25 acres treated)

Sample 1 – concentration through time ND	**Sample 2 – concentration through time** ND
Sample 3 – concentration through time ND	

Treatment Site: Driftwood Shores (approximately 65 acres treated)

Sample 1 – off-site transport ND	**Sample 2 – off-site transport** ND

Treatment Site: Triangle Cove East (approximately 65 acres treated)

Sample 1 –concentration through time 0.003 ppm	**Sample 2 – concentration through time** 0.002 ppm

Treatment Site: Triangle Cove West (approximately 65 acres treated)

Sample 1 – concentration ND	**Sample 2- concentration** ND

Summary of Glyphosate Presence

Sampling for glyphosate was desined to detect the presence of the herbicide directly after application at the treatment site (concentration), directly after application away from the treatment site (off-site transport) and at the treatment site 24 and 48 hours after application (concentration through time). All the samples that were analyzed and found to have presence of herbicide were at acceptable levels.

Treatment Site: South Nahcotta (approximately 65 acres treated)

Sample 1 – concentration 0.792 ppm	**Sample 2 – concentration** 0.264 ppm
Sample 3 - concentration ND	

Treatment Site: South Nahcotta (approximately 65 acres treated)

Sample 1 – concentration through time ND	**Sample 2 – concentration through time** ND
Sample 3 – concentration through time ND	

Treatment Site: Driftwood Shores (approximately 65 acres treated)

Sample 1 – off-site transport ND	**Sample 2 – off-site transport** ND

Treatment Site: Triangle Cove East (approximately 65 acres treated)

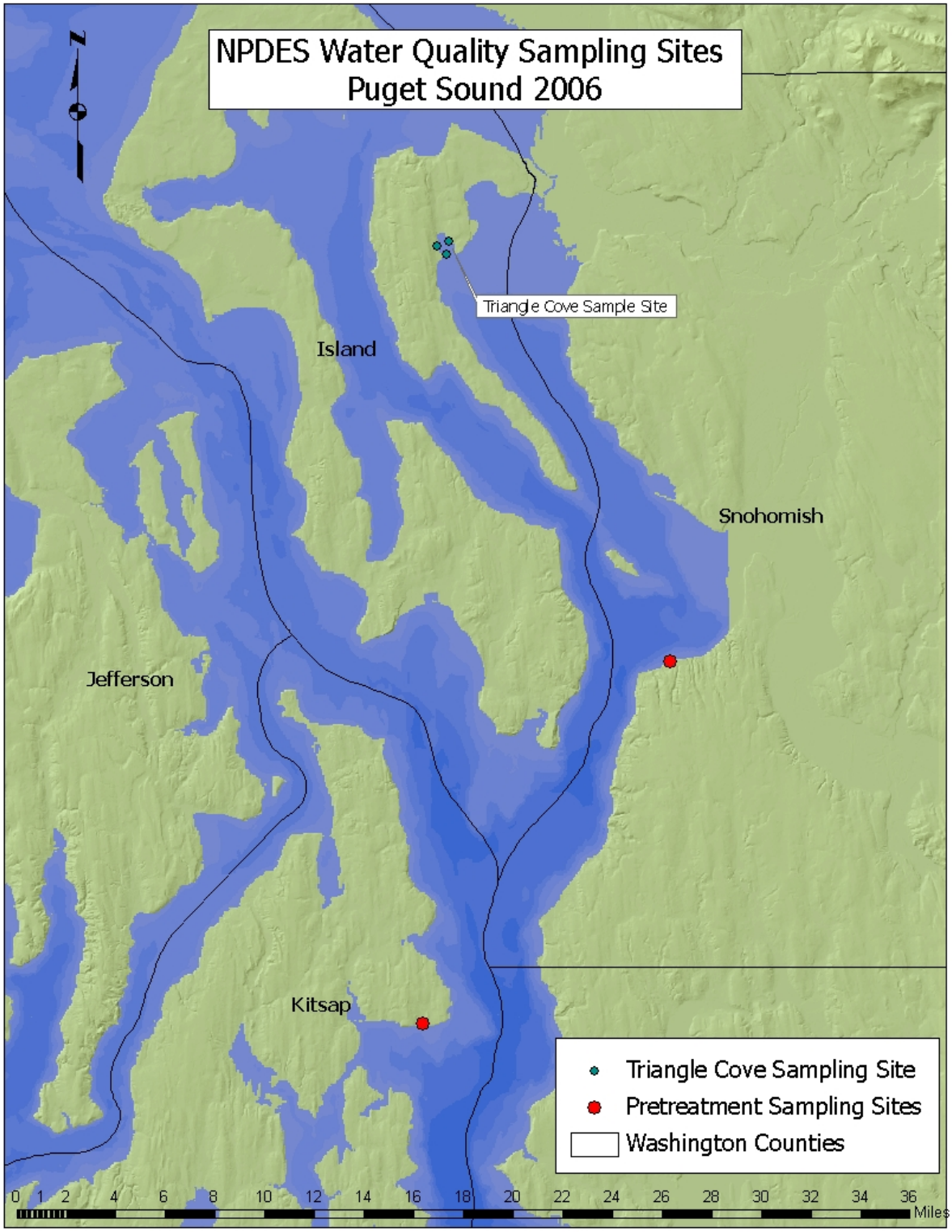
Sample 1 – concentration through time ND	**Sample 2 – concentration through time** ND

Treatment Site: Triangle Cove West (approximately 65 acres treated)

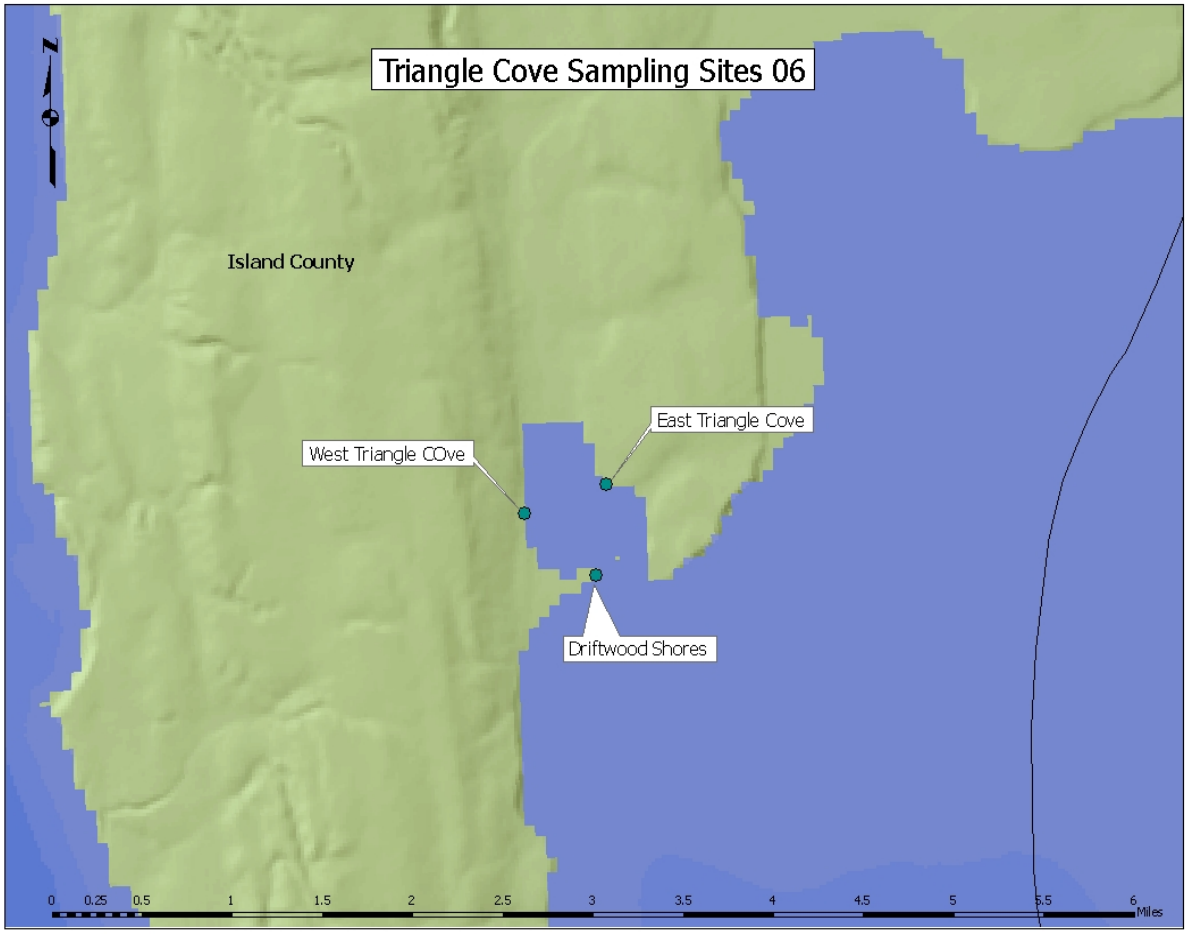
Sample 1 – concentration ND	**Sample 2 – concentration** ND

Sample Locations

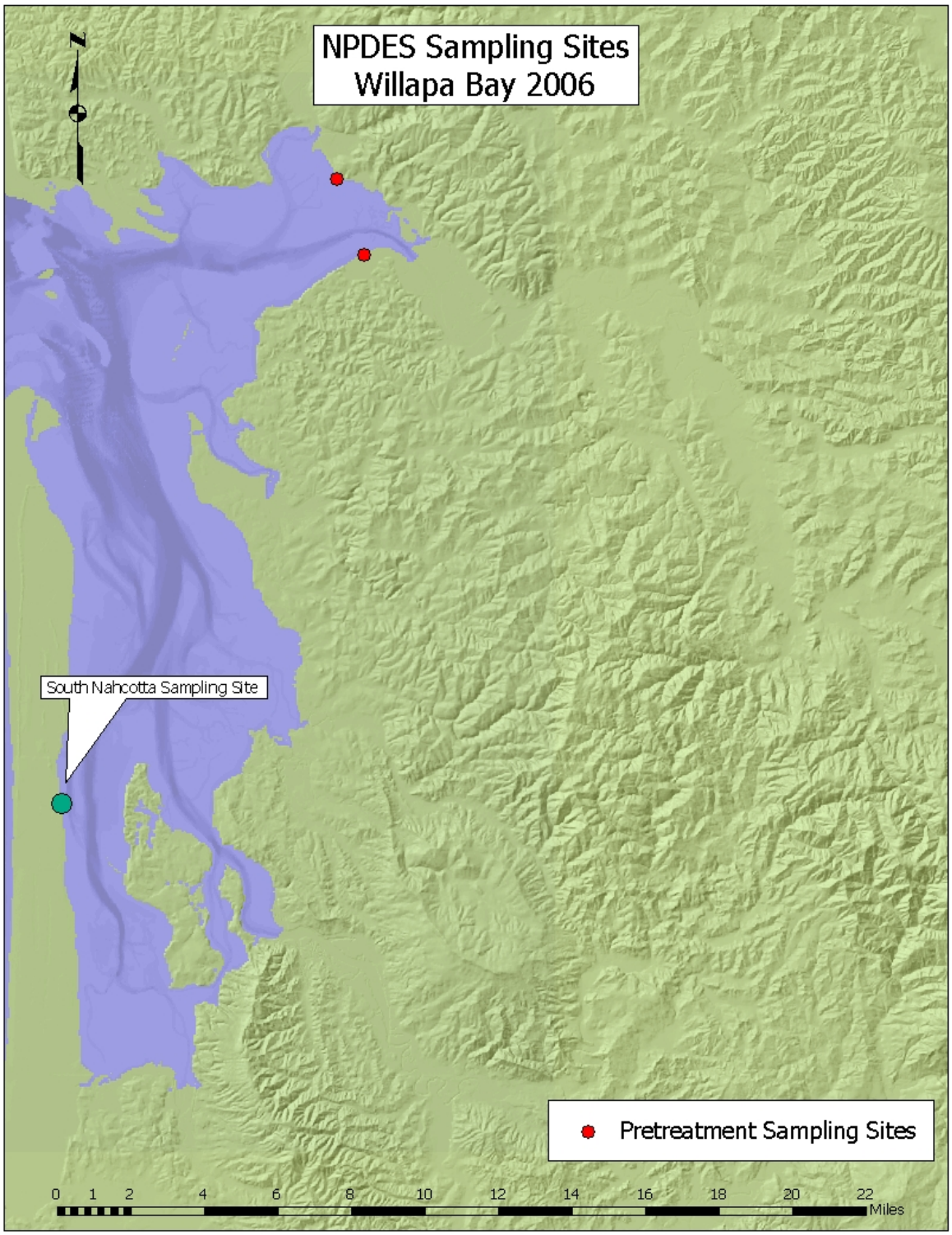
Puget Sound



Triangle Cove



Willapa Bay


NPDES Sampling Sites
Willapa Bay 2006
N
South Nahcotta Sampling Site
Pretreatment Sampling Sites
0 1 2 4 6 8 10 12 14 16 18 20 22
Miles

Attachment B
Signatory Page

I certify under penalty of law, that this document and all attachments were prepared under my direction, or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiries of the person or persons who manage the system, or those persons directly responsible for gathering information, in information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

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